URBAN GREENING FOR HEALTHIER AGEING: GAPS IN KNOWLEDGE AND HOW WE CAN PLUG THEM TOGETHER

Associate Professor Thomas Astell-Burt and Dr Xiaoqi Feng
Population Wellbeing and Environment Research Lab (PowerLab)
School of Health and Society, Faculty of Social Sciences, University of Wollongong

Abstract

Green space is increasingly prominent in public health research, but many important details remain unknown. In this presentation, we outline the state of evidence on green space and health. We identify three of the bigger issues currently vexing some epidemiologists that are also important to the wider green space enterprise. Finally, we suggest some avenues in how we can plug these gaps in knowledge together.

Epidemiology now

Why would two epidemiologists be interested in trees? Other than for their uncanny ability to brighten up practically any streetscape with their natural beauty? Epidemiology, according to the British Medical Journal, concerns the understanding of how often diseases occur in different groups of people and why. Information from epidemiological studies has been used to plan and evaluate strategies to prevent illness [1]. Epidemiologists have also worked with clinicians to contribute to guidelines on the management of patients in whom diseases have already developed [2]. So once again, why the interest in trees?

First let us consider two figures who are, or were until fairly recently, mainstream in popular culture. Take Sherlock Holmes, for example, and his attempts to thwart an evil genius who was seemingly hell bent on doing major harm (or worse) to one or many people. Gregory House MD is another popular rogue who would appear to stop at little (other than seemingly any opportunity to berate a colleague) to diagnose a condition and save the life of a patient. Disclaimer: neither Sherlock Holmes nor Gregory House are epidemiologists. But their common pursuit of an answer to a question that could save lives through scientific observation, pattern detection and hypothesis testing is precisely what epidemiologists do. Except whereas the two aforementioned mavericks tend to focus on one patient at a time, we are more interested in entire communities, cities and countries, protecting the health of millions at a time [3].

A vicious cycle

As epidemiologists we are interested in identifying, measuring, describing, evaluating and helping to optimise access to phenomena that helps to keep people healthy and out of hospital. You may think that is what the health sector is for, but you'd only be partially right. If a person visits an emergency department for a heart attack, receives world class care and recovers sufficiently to be discharged, that is an excellent result. But the downright abominable news is that once that person leaves hospital for home, they are often returning to the very same circumstances that contributed to their need to go to hospital in the first place [4]. Deprivation. Stress. Pollution. Sedentary lifestyles. Loneliness. Discrimination. Bad food. It's a vicious cycle. A cycle that the health sector can't break on its own [5]. Not only do we need to think outside the square to solve this question, but unless you happen to wake up one fine Australian morning with a startling epiphany that Holmes or House would be proud of, we clearly also need to work together as a society [6,7].

Breaking the cycle

This is where trees come in. A great deal of scientific research (including our own) has been conducted for over 20 years now that suggests evidence for what you may already hold true. That is, trees support our wellbeing [8-11]. We are enhanced, psychologically and physiologically, by exposure to trees and green spaces more generally

(e.g. [12-14]). Green salubrious landscapes to go for a nice quiet stroll. To push a pram. To walk a dog. To take a brisk jog. To shelter from the heat. To take a breath of fresh air. To think. To play. To relax and marvel. To have a gathering with family. To meet new friends. To escape from the madding crowd.

So while reality television shows report the latest dietary fads, national guidelines prescribe the minimum amount of physical activity we should be doing and the President of the Australian Medical Association suggests we should all take more responsibility for our health, it's a Pythonian statement of the bleeding obvious – but we shall say it anyway – that the circumstances we are in affect what we can and cannot choose to do. Difficult to choose to benefit from a park if there isn't one located nearby. To promote healthier people, we cannot put all of our eggs in one basket; we need to consider health and wellbeing implications in decision-making in all sectors, not just the health sector.

Accessing green space – does everyone have a fair go?

Our research shows that people living in lower income neighbourhoods in Sydney, Melbourne, Brisbane, Perth and Adelaide tend to have less access to green space nearby where they live [15]. Communities living in Western Sydney, known for socioeconomic disadvantage and serious health challenges like type 2 diabetes, also tend to have less green space nearby than their counterparts in the affluent North Shore and Eastern suburbs. What this means is that for many communities where chronic diseases are more common and the odds of repeat hospitalisation are higher, the availability of green space tends to be lower. More trees will not be the panacea for all of society's problems, but an equalisation of access to quality green spaces is likely to give everyone a fairer go at gleaning all those benefits from trees *et al*.

How much green for healthy ageing?

Now we could stop there, but as epidemiologists, we not only care about the big picture, but we care about the details too. There is actually much about the relationship between green space and health that we just do not know enough about yet. The recent Harvard Natural Environment Initiative position statement summed up many of the holes in the evidence base [16]. A big one, from the point of view of urban planning and people in green space-related industries, and increasingly from our point of view too, is how much green space is needed to elicit a health benefit? It is probably not a straight line relationship. Think of income. An extra $100 a year for a person earning just $50,000 annually is unlikely to make much difference, but an extra $10,000 could make a potentially very significant difference to their quality of life. An extra $10,000 a year for a person already earning $500,000 annually may, on the other hand, be largely inconsequential.

It might be the same with trees and green spaces more generally. For people with very little green space nearby, a little addition may be tokenistic with respect to health, but it may not actually take a huge amount of new greenery to stimulate a meaningful health response. A reasonable investment with a potentially big benefit for the community. Even more greenery in communities where green space is already abundant may, on the other hand, may yield only marginal returns for health; ergo the 'law of diminishing returns'. The effect of increasing the quantity of green space on community health could, we suspect, be curvilinear. Some research has already shown that the association between green space and mental health varies between men and women by age group [17]. But there just isn't much evidence on how much green space is the optimal amount for health gain and whether this varies within the population at the moment.

Same quantity, different arrangement?

This then leads to an issue of formation. In terms of the health of an entire community, is it better to have lots of tiny pocket parks, or the same amount of green space clustered within a smaller number of larger parks that are easily accessible within a short walking distance? Evidence suggests that bigger green spaces are more likely to offer the types of surroundings that enable physical activity [18-20]. But if the many pocket parks spread across a suburb are well-connected by properly maintained pathways, decent street-lighting and reasonable visibility, could this provide a substitute in contexts (e.g. downtown city centres) where land values are prohibitive for the development of new larger green spaces?

Again, not much evidence so far, but clearly it is not particularly useful for researchers to suggest that there needs to be a minimum of 40% green space, for example within an inner city neighbourhood that is already very densely composed and difficult to change (at least in the short term). We need to understand more clearly, with better evidence, how different patterns of green land use can give the same health benefit and under what conditions we can optimise those benefits for everyone.

Green space as preventive healthcare?

Finally - and this is a big one for many people in the health sector – if trees and green spaces really are consequential for the health of the population, to what extent can we say that the dollars invested in green space help us to break the vicious cycle of repeated hospitalisation for reasons that we know can be avoided? That is, are dollars invested in green space having a trickle-down effect, saving health sector dollars in the long-term that could then be reallocated to other health issues? Remember, it is not a case of saving money *per se*, but using money efficiently to get an even better health-focussed 'bang for buck'.

If levelling up the inequity of green space availability within Australian cities helps to break the cycle of repeat hospitalisation by providing people with opportunities to choose, if they so wish, to visit places where they can relax, socialise, participate in outdoor recreation and feel great, regardless of their socioeconomic circumstances, then that would constitute an important element of a whole of society preventive health strategy. But have there been many studies linking up spatial indicators of green space provision with health service use, cost and quality of life data? Unfortunately, there have not.

Data and collaboration is needed to plug these gaps

Fortunately, the slowly creeping, incremental improvements in data availability within Australia and other countries suggests that these studies may well be possible in the hopefully not too distant future. In the Population Wellbeing and Environment Research Lab, or what we call the "PowerLab" at the University of Wollongong (see Figure 1), our team of epidemiologists, biostatisticians and geographic data scientists are dedicated to finding the answers to the three questions posed and more. We have recently been awarded research funding to begin to answer some of these questions from the National Heart Foundation of Australia and the National Health and Medical Research Council. We are enthused by the challenge of identifying how much and what formation of green space might contribute in a small, but significant way to keeping people healthy and out of hospital.

Figure 1

Data availability cannot come soon enough and it is clear that while satellite imagery can inform us on how much greenery is available within a particular area, this tells us little about what is in the green space and how well connected it is with other aspects of the built environment that people value. This not only includes things like retail and services, but also psychosocial factors such as feeling safe to walk outdoors in the evening. This type of information is crucial, but difficult to get from one source. It is likely to come from the communities living and the organisations and companies working in those areas. We do not need the genius of Sherlock Holmes or a maverick stylings of Gregory House. We need to work together, in partnership, to find the solutions that will benefit the whole of society; millions at a time.

The PowerLab has a strong track record of working with the local health sector, such as the Diabetes Initiative with Western Sydney Local Health District and Primary Health Network. We have also conducted some of the largest studies of green space and health in the world here in Australia. We now want to reach out to all members of TREENET, to local councils, garden centres, the park and leisure industry, landscape architects and others who are similarly enthused with the benefits of green space, to develop a green space geospatial data-sharing alliance the likes of which have not been seen before in Australia. An alliance with a common purpose, that is, to develop better evidence on the benefits of green space for public health. To develop evidence-based guidelines on how much green space is needed and maps of where investments ought to be targeted. On September 1st 2016, at the 17th National Street Tree Symposium, let's get started.

References

1. Starfield B, Hyde J, Gérvas J, Heath I. The concept of prevention: a good idea gone astray? *J. Epidemiol. Community Health.* 2008;62(7):580-583.
2. Colagiuri S. Optimal management of type 2 diabetes: the evidence. *Diabetes, Obesity and Metabolism.* 2012;14:3-8.
3. Berkman LF, Kawachi I, Glymour MM. *Social epidemiology.* Oxford University Press; 2014.
4. Wilkinson R, Marmot M. *Social determinants of health: the solid facts.* World Health Organization; 2003.
5. Astell-Burt T, Feng X. Geographical inequity in healthy food environment and type 2 diabetes: can we please turn off the tap? *Med. J. Aust.* 2015;303(4):246-248.
6. Armstrong F, Alsop A. Debate: co-production can contribute to research impact in the social sciences. *Public Money & Management.* 2010;30(4):208-210.
7. Martin S. Co-production of social research: strategies for engaged scholarship. *Public Money & Management.* 2010;30(4):211-218.
8. James P, Banay RF, Hart JE, Laden F. A Review of the Health Benefits of Greenness. *Current Epidemiology Reports.* 2015;2(2):131-142.
9. Lachowycz K, Jones AP. Greenspace and obesity: a systematic review of the evidence. *Obes. Rev.* 2011;12(5):e183-e189.
10. Lee ACK, Maheswaran R. The health benefits of urban green spaces: a review of the evidence. *Journal of Public Health.* 2010;33(2):212-222.
11. Hartig T, Mitchell R, de Vries S, Frumkin H. Nature and Health. *Annu. Rev. Public Health.* 2014;35:207-228.
12. Hartig T, Book A, Garvill J, Olsson T, Garling T. Environmental influences on psychological restoration. *Scand. J. Psychol.* 1996;37(4):378-393.
13. Bodin M, Hartig T. Does the outdoor environment matter for psychological restoration gained through running? *Psychol. Sport Exerc.* 2003;4(2):141-153.
14. Park BJ, Tsunetsugu Y, Kasetani T, Kagawa T, Miyazaki Y. The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): evidence from field experiments in 24 forests across Japan. *Environ. Health Prev. Med.* 2010;15(1):18-26.
15. Astell-Burt T, Feng X, Mavoa S, Badland HM, Giles-Corti B. Do low-income neighbourhoods have the least green space? A cross-sectional study of Australia's most populous cities. *BMC Public Health.* 2014;14:292.
16. Africa J, Logan A, Mitchell Rea. *The Natural Environments Initiative: Illustrative Review and Workshop Statement.* Harvard Center for Health and the Global Environment; 2014.
17. Astell-Burt T, Mitchell R, Hartig T. The association between green space and mental health varies across the lifecourse. A longitudinal study. *J. Epidemiol. Community Health.* 2014;68:578-583.
18. Astell-Burt T, Feng X, Kolt GS. Neighbourhood green space is associated with more frequent walking and moderate to vigorous physical activity (MVPA) in middle-to-older aged adults. Findings from 203,883 Australians in The 45 and Up Study. *Br. J. Sports Med.* 2014;48(5):404-406.
19. Astell-Burt T, Feng X, Kolt GS. Greener neighborhoods, slimmer people? Evidence from 246,920 Australians. *Int. J. Obes.* 2014;38(1):156-159.
20. Giles-Corti B, Broomhall MH, Knuiman M, et al. Increasing walking: How important is distance to, attractiveness, and size of public open space? *American Journal of Prev Med.* 2005;28(2S2):169-176.